

Series
2000

AP-DOC-012
Application
Note

Loading the DiskOnChip[®] 2000
S/W as a Device Driver

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1. Preface

The purpose of this application note is to explain how to access the DiskOnChip 2000 with a device driver instead of using the built-in BIOS extension firmware. This application note is applicable only to PC compatible systems that have an alternative boot device and boot up into DOS, Win3.x, or Win95. This application note is not applicable to the other operating systems supported by the DiskOnChip such as: QNX, VxWorks, pSOS, and WinCE.

In order to use the DiskOnChip as a disk drive, special drivers are required. Normally, these drivers are installed automatically when the PC is booted up. The drivers are loaded in by the BIOS from the ROM extension firmware located in the DiskOnChip itself. However, there are cases where this method will not work, such as a BIOS that has a non-standard ROMSCAN routine, or when debugging a new system. In addition, there are applications in which the DiskOnChip is placed on purpose in a non-standard location. An example for such typical application is a DiskOnChip which is used as data-storage-device only, while the OS and the code are booted from Hard Disk. This application note describes an alternative method for installing the required drivers.

For additional information regarding the normal method, i.e. ROM extension, used to install the DiskOnChip drivers, please refer to the *DiskOnChip 2000 User Manual*.

2. Driver installation for Windows or DOS Operating Systems

2.1 Hardware Configuration

To access the DiskOnChip, an 8 KByte space is required in a PC's address space. Normally, if the firmware drivers are loaded from the DiskOnChip then this address space must be located in a region that is scanned by the BIOS, e.g. C8000-EFFFF. However, in this case the DiskOnChip can be located at any memory address below 1 MByte, as long as it does not conflict with any other device. The base address of this window is set in hardware. Please refer to your platform's user manual to determine this address.

2.2 Software Configuration

This application note is applicable for DiskOnChip software version 1.05 and above.

2.3 CONFIG.SYS modifications

1. Copy the following files from the DiskOnChip 2000 distribution diskette (version 1.05 or above) to your system (the files are located under AP012 directory). The latest version can be also downloaded from M-Systems' web site (<http://www.m-sys.com>).

DOC2SS.COM - DiskOnChip 2000 Socket Services

DOC2TFFS.COM - DiskOnChip 2000 DOS-installable Device Driver

2. Add the two following lines to your CONFIG.SYS file.

DEVICE=<path>DOC2SS.COM

DEVICE=<path>DOC2TFFS.COM

where *<path>* points to the location of the DiskOnChip socket services and driver.

Both DOC2SS.COM and DOC2TFFS.COM are also DOS-executable programs, which may be run from the command-line. However, they will successfully install from the DOS command-line only if the /DRIVE switch is specified (Refer to Section 2.4.1 DRIVE - SHARING CUSTOM INSTALLATION, for further information on the /DRIVE switch).

The DEVICE line may be placed anywhere in the CONFIG.SYS file. However, DiskOnChip Driver should be installed **after the** Socket Services.

The DEVICE lines define one drive letter for the flash media to be accessed via TrueFFS. If drive-sharing is not used, new drive letter will be created. DOS allocates drive letters sequentially. The first drive letter used depends on which devices are installed in the system prior to DiskOnChip. If the hard disk C: was the last drive allocated, DiskOnChip drive letters will start with D:.

The number of drive letters defined by the DEVICE line is the number of sockets reported by the Socket Services **Inquire Adapter** function, for the adapter selected by the /ADAPTER parameter (adapter 0 is the default) (always 1).

3. If a memory-manager, such as EMM386 or QEMM, is installed, the specified address range is excluded from its management. For example, to exclude the memory area D000 to D3FFF from EMM386 space, add X=D0000-D3FFF to the DEVICE=EMM386 line of your CONFIG.SYS file.

2.4 DOC2TFFS.COM Parameters

The following command-line options may be used after the driver filename in the DEVICE line:

/DRIVE= Refer to Section 2.4.1 DRIVE - SHARING CUSTOM INSTALLATION, for details on this option.

/SIZE= Specifies the buffer size, in bytes, that will be allocated for TrueFFS data. The default is 4096. Valid values range from 1000 to 32767. The required size depends on the sizes of the flash media that will be accessed, and the number of flash media that are accessed simultaneously on different sockets. The default size of 4096 can sufficiently handle a DiskOnChip 2000 of up to 20 MBytes.

Specify a smaller value to save memory space, or a larger value to support a large configuration, as in the following example:

DEVICE=DOC2TFFS.COM /SIZE=1500

For specifications regarding the required memory size, refer to Appendix C, TrueFFS Memory Requirements.

Note: The SIZE parameter value must be sufficiently large. TrueFFS will not be able to access a flash media that requires memory space which is not available. In this case, access to that media will cause the following, somewhat inappropriate, DOS error message to be issued:

OUT OF PAPER ON DRIVE XXX

/ADAPTER= This option specifies the Socket Services adapter to be accessed by the TrueFFS driver. Only sockets defined on this adapter are defined as DOS drives.

The default is adapter 0 (the first adapter). Any adapter defined by Socket Services may be selected.

The value 99 specifically refers to the **last** adapter in the system.

The DiskOnChip driver may be installed more than once, so that different DiskOnChip devices may be installed and accessed on the same computer.

For example:

DEVICE=DOC2TFFS.COM /ADAPTER=0

/WINDOW= Specifies a DOS segment value where a memory window may be set-up through Socket Services. For example:

DEVICE=DOC2TFFS.COM /WINDOW=D200

This option is necessary if your Socket Services implementation does not configure memory windows automatically during initialization. In this case, TrueFFS needs to configure a window for access to the adapter.

When the **/WINDOW** parameter is specified, TrueFFS attempts to configure windows as follows:

Each socket has a separate window. TrueFFS attempts to program the window size to 8 KBytes, or to the closest possible value. For example, if the adapter has two sockets, and the **/WINDOW** value is set at D200, the first socket's window will be programmed at segment D200 to D3FF, and the second socket's window will be programmed at segment D400 to D5FF.

Be sure that the specified memory range is not used by any other I/O or memory device in your system, and is excluded from use by any memory-manager such as EMM386 or QEMM.

/NOPOLL Disables the polling of the socket through a timer interrupt, for use if such polling is considered harmful.

In this mode, TrueFFS functionality is somewhat reduced: card changes are detected through the Socket Services card-change indication. If such an indication is not available, card changes are not detected, and the system should be rebooted with every card change. Write performance may be degraded somewhat due to the different handling of Vpp power levels.

/PWLIMIT= The power limit parameter is used to limit the number of Flash chips that will be written or erased simultaneously by TrueFFS. This parameter may be used to restrict Flash parallelism to a value that will not exceed the adapter's current limit.

For example:

/PWLIMIT=1

Will limit access to one Flash chip only, even on card or arrays that have interleaving (access to different Flash chips on consecutive addresses).

By default, flash parallelism is not limited.

/NO_SUSPEND_CHANGE

TrueFFS attempts to detect a suspend operation (power-down of the socket or of the entire system), and will report a card-change condition in this case. The reason is that TrueFFS cannot be sure that the card was not changed while the system is suspended. This may create a problem in some applications. Say you have an application that opens files in a program on a Flash card. If the system is suspended and then reawakened, the media change condition will make the file. To prevent this scenario, specify this keyword in the command-line. However, be aware that in this case it is safe to change cards only when the system is not suspended.

2.4.1 Drive - Sharing Custom Installation

The DiskOnChip may be installed to use drive-letters already in existence, rather than create new drive-letters for the flash media. This is useful when you want to run DiskOnChip device driver from command line.

For example, to install DiskOnChip on existing drive-letters starting with D:

DEVICE=DOC2TFFS.COM /DRIVE=D

Drive-sharing installation need not be done from CONFIG.SYS. It may be done by directly executing the driver from the DOS command-line, e.g.:

C:> DOC2TFFS /DRIVE=D /SIZE=2000

Mounted state: if a DiskOnChip with a proper TrueFFS format is used, DiskOnChip driver controls the drive.

Note:

The UNMOUNT utility may be used to force DiskOnChip off the drive when it is in the mounted state.

Some restrictions apply to this option:

- The drive letter specified must be in existence at the time DiskOnChip is installed.

The DiskOnChip 2000 contains a built-in M-Systems industry-standard TrueFFS software, which makes the DiskOnChip operate as a standard disk drive. The DiskOnChip 2000 can contain the operating system in it to allow systems to boot without a hard disk. The DiskOnChip 2000 can also be configured as the boot device in systems with a hard disk (refer to the DiskOnChip User Manual for “*Configuring the DiskOnChip 2000 as the first drive*”).

3. Differences from automatic drivers loading

Although the basic function and behavior of the DiskOnChip 2000 are the same both for drivers automatically loaded and drivers loaded according to this application note, there are some minor differences:

1. the DFORMAT utility must get the /Win parameter. The option to accept the drive letter is not valid here.
2. The DINFO utility can't recognize the driver.

Accept for the above two, the DiskOnChip user manual is fully applicable for this method.

4. Optional - Preparing the DiskOnChip 2000

Usually, the DiskOnChip drivers are loaded automatically at boot time during the ROM expansion search stage. This application note assumes that the DiskOnChip is not located in the memory region being searched at the ROM expansion stage. In such case the drivers will not be located and loaded at the boot time. However, if it is required to use the method of loading the DiskOnChip drivers as a device driver and having the DiskOnChip located at memory region being searched at the ROM expansion search, there will be a conflict since the drivers will be loaded twice. In such case it is required to prepare the DiskOnChip to prevent its drivers from being loaded automatically at the ROM expansion search stage. In order to do so, please follow these steps: :

1. Load the DiskOnChip without the CONFIG.SYS modifications described above. Identify the drive letter assigned to the DiskOnChip by the Operating System.
2. Replace the firmware installed on the Flash media inside the DiskOnChip (assuming it was drive C)
DUPDATE C: /S:DOC2.FFF
(in case the drive letter assigned was different, use the correct drive letter instead of C).
3. Verify the last operation by rebooting. This time the DiskOnChip is not supposed to load its drivers (no loading messages should be seen) , therefore no drive letter should be assigned to.
4. Modify the CONFIG.SYS according to this application note and re-boot. This time the DiskOnChip should be assigned a drive letter and appear as standard disk in the system.

5. Required Files

All files required for the DiskOnChip in order to implement this application note are included in the standard distribution diskette, in the AP012 subdirectory.

The contents of the diskette can also be downloaded from M-Systems' web site (<http://www.m-sys.com>).

6. Additional information and Tools

Document/ Tool	Description
AP-DOC-10	Designing with the DiskOnChip 2000
AP-DOC-11	Write Protecting the DiskOnChip 2000
DiskOnChip 2000 Data Sheet	DiskOnChip Data Sheet
DiskOnChip 2000 Utilities	DiskOnChip 2000 Utilities User Manual
DiskOnChip2000-EVB	DiskOnChip Evaluation Board
DiskOnChip2000-PIK	DiskOnChip Programmer and Integrators Kit
DiskOnChip-GANG	8 Socket Gang Programmer ¹

¹ Contact M-Systems for availability

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